# A STUDY OF SPOTTED DEER AND BLACKBUCK
# IN GUINDY NATIONAL PARK, MADRAS - 1991

Report for the Period January to December 1991

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## 1. INTRODUCTION

The current study of Spotted Deer (*Axis axis*) and Blackbuck (*Antilope cervicapra*) in the Guindy National Park, Madras was undertaken to monitor the populations of the two large mammals and study their behavioural ecology. The study also encompasses aspects of the population dynamics, population structure, grouping behaviour, breeding seasons, feeding habits and habitat preference of the two mammals. The study was undertaken under the guidance of Dr.R.Sukumar, Centre for Ecological Sciences, Indian Institute of Science, Bangalore, and under the auspices of the Tamil Nadu Forest Department.

This is a preliminary report for the period January to December 1991 giving the results of the spotted deer and Blackbuck censuses in the Park. A more complete report incorporating the results of the studies on the other aspects of the biology of the two mammals is under preparation.

## 2. MATERIALS AND METHODS

### : STUDY AREA :

Guindy National Park is situated in Madras city, Tamil Nadu and comprises an area of 270.57 hectares today. Other than the Blackbuck, the park also harbours a sizable population of spotted deer and other mammals like Bonnet macaque (*Macaca radiata*), common mongoose (*Herpestes edwardsii*), small Indian civets (*Viverricula indica*), jackals (*Canis aureus*) and palm squirrels (*Funambulus palmarum*). The park also harbours an astonishing number (about 130) of bird species.

There is a marked diversity of flora - from dense forest to open scrubland and grassland. There are about 200 species of trees, shrubs, climbers, herbs, sedges and grasses, both native and exotic. Species characteristic of the local scrub jungle are *Randia* sp., *Carissa spinarum, Todalia asiatica, Feronia elephantum, Zizyphus xylopyrus, Dichrostachys cinerea.* (Selvakumar, 1979). The diversity of vegetation here is important as it determines the distribution of the two ungulates in the Park. There are two tanks, occupying a combined area of 30.4 Ha. and two temporary ponds. They remain dry or partially filled for much of the year.

The Park was divided into three main vegetation types for the purposes of censusing: i) **Dense Forest** : characterised by *Acacia planifrons* canopy and a dense undergrowth of *Glycosmis* spp. and *Clausena* spp. This occupies the extreme eastern and western edges of the Park. The vegetation at the western extremity of the park is probably the remnant of the original vegetation of the region (Sukumar, pers. comm.) and it is characterised by the presence of *Acacia sundra* and the exotic cactus *Cereus.* ii) **Scrub** : characterised by *Borassus flabellifer* and malformed palatable shrubs like *Carissa* spp. and *Randia* spp. iii) **Open Meadow:** this occupies a small area of the park (Polo Field) measuring 180 X 135 metres with chiefly 16 species of herbs and grasses.

## : STUDY METHODS :

**Transects:** Censusing was done by line transects using stratified random sampling. Three transects were placed randomly, and each transect was walked once in the morning (between 0600 and 0900 hrs) and once in the evening (between 1600 and 1900 hrs) every month. Thus, a total of about 6 km of transect was walked every month. The transects, each about 1 km in length, were placed in the two main vegetation types in the park, one in the dense forest and two in the scrub. The lengths of the transects were estimated using the stride measurement of the observer. The length of the transects are roughly proportional to the area under that vegetation type. The computer program TRANSECT was used to estimate density. The computer Program TRANSECT was used for estimation of the population density of Spotted Deer (*Axis axis*) in Guindy National Park, Madras. Program TRANSECT is a FORTRAN 77 code to analyze line transect data as described by Burnham et al. (1980)

Observations of groups were recorded while walking at a uniform pace of 1.5 to 2 km/hour. Perpendicular distances to the centre of the group were estimated visually or, in case of doubt, by the stride measurement of the observer pacing upto the spot. From August onwards a Range Finder was used for estimating perpendicular distances. A 7X50 binoculars was used for observations. The censusing was done by the author, alone, to minimise disturbance.

**Census of Blackbuck :** Blackbuck exhibit a patchy distribution. Their distribution showed a distinct preference for open and semi-open areas. The polo field is a favourite place where Blackbuck congregate in fairly large numbers. No transect passed through Polo Field where there is usually a large number of Blackbuck. Hence, total counts were made each month, of the Blackbuck on the open meadow in the mornings and evenings before or after the regular transects were done. The density estimate of the TRANSECT program was extrapolated to the rest of the Park (excluding polo field) and the total figure so derived was then added to the average of the counts done on the meadow (Polo Field) to get the total number of Blackbuck in the park. A total count was attempted on foot at the end of the year.

## 3. SPOTTED DEER (*Axis axis*)

### : ESTIMATION OF DENSITY & POPULATION SIZE:

: ***Data Features*** : The TRANSECT analysis has been used for all the monthly transect data. The data were grouped into 10 perpendicular distance intervals, each of 5 metre width, (0-5m, 5-10m .. and so on upto 45-50m) for entry into the program. The data were truncated at 50 metres width, i.e. sightings of groups more than 50 metres away from the transect line were omitted in the analysis. A total of 317 sightings of spotted deer were made. Truncation, as above meant excluding 48 (15%) sightings which were beyond 50 m from the transect line. Burnham *et al.* (1980) recommend exclusion of outliers, or 5-10% of the sightings which are at farthest distances from the transect line, as these have little effect on the density estimate, but complicate the estimation the process. Hence, alternate perpendicular distance ranges of 10 metres each (0-10m, 10-20m ... 70-80m) were tried and the both the Fourier Series (FSER) and Half Normal (HNOR) Estimators were used to estimate density. Here, only 6% (20) of the outlying sightings were excluded. However, since only visual estimation of perpendicular distance was used till the Range Finder was available in August, some of the sightings beyond 50 metres were probably not very accurate.

### : *Results and Discussion* :

The Fourier Series Estimates for both the perpendicular distance interval widths puts the mean density of *groups* at about 60/km². The mean group size in the National Park was calculated from complete groups seen between 0600-0900 hrs and between 1600-1900 hrs - the times when transects were done (N = 976). The mean density of groups multiplied by the mean group size gives an mean individual density of **168 chital / sq. km.** The Mean **Total Population** of chital is thus **455 animals plus or minus about 67 animals** (95% confidence interval) (see Table 1).

Table 1 : Spotted Deer Density in Guindy National Park 1991

| S. No | Time Period | Estimator | Perpendicular dist. data type | N | Mean Density of Groups (Dg) /km2 | Mean Density of Chital (D) /km2 | %age Coefficient of Varn. %Cv | 95% Confidence Interval of D /km2 | Total Pop. Mean | 95% C.I. of Total Pop. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Jan to Dec | FSER | 5m widths | 259 | 60.5 | 168.7 | 7.6 | 143.7-193.7 | 456 | 389-524 |
| 2. | Jan to Dec | HNOR | 5m widths | 259 | 59.9 | 167.0 | 8.2 | 140.4-193.7 | 452 | 380-524 |
| 3. | Jan to Dec | FSER | 10m widths | 297 | 60.1<br>SE: 4.547 | 167.6 | 7.6 | 142.8-192.5 | 453 | 386-521 |
| 4. | Jan to Dec | HNOR | 10m widths | 297 | 55.1 | 153.6 | 7.4 | 131.5-175.7 | 416 | 356-475 |

FSER - Fourier Series Estimator HNOR - Half Normal Estimator
N - Sample Size C.I. - Confidence Interval Pop. - Population

I believe that the FSER estimates of the total population (mean) are slightly on the higher side. The transect through the forest may have contributed towards this overestimate as it was somewhat close to and almost parallel to a major road for a sizable stretch. The actual figure is thus probably in the lower half of the confidence interval of the total population. *Thus, the total population is probably about 380-450 chital and a figure of 415 chital,* or a density of 150 chital / $km^2$, *can be used for convenience.* It is seen that the Half Normal Estimator (HNOR) gives values similar to those of the Fourier Series Estimator (FSER). The HNOR using the data grouped in 10 metre intervals gives the least coefficient of variation. It reports a density of 153.6 chital/sq. km and a mean total population of 416 chital in Guindy National Park. (95% C.I. = 356-475 chital). This is almost exactly equal to the number evaluated above.

**Density Comparisons : Previous Estimates and Densities in other Natural Areas:**

The census figures for G.N.P. for the last several years were not immediately available. A select list of population/density estimates over the years for the chital popularion in G.N.P., is however given in Table 2. The population densities of chital in some select natural areas and sanctuaries is given in Table 3 for comparison with the figure for Guindy National Park.

Table 2: Comparison of Chital Density with some previous estimates for G.N.P.

| | Year(s) | Density /km2 | Source |
|---|---|---|---|
| 1. | 1991 | 150.0 | Present Study |
| 2. | 1979 | 145.3 | Selvakumar, 1979 |
| 3. | 1975, 78, 79, 80<br>-Avg. of 4 cens.- | 152.3* | Forest Dept.<br>(Menon, pers. comm) |
| 4. | 1981-82<br>-Avg.of 5 Cens- | 200.9* | Menon, 1983 |
| 5. | 1976 | 450.0 | Forest Dept. in Miura, 1981 |
| 6. | 1991 | 186.1 | Forest Dept. - July & Dec 1991 |

* - For an area of 323.8 ha.

Table 3: Comparison of Chital Density with some other Natural areas

| | Place/Year | Density /km2 | Source | |
|---|---|---|---|---|
| 1. | **Kanha** (M.P.) 1967 | 23.2<br>(2.8-3.1 for the whole park) | Schaller, 1967 | |
| 2. | **Nagarhole** (Karnataka) | 50.6 | Karanth (pers. comm.) | |
| 3. | **Bandipur** '74-5 | | Sharatchandra & Gadgil, 1975 | |
| | -Tourist Zone | 36.0 | | |
| | -Bolagudda | 85.0 | | |
| 4. | **Corbett** Nat. Park, (U.P.), 1966 | 87.4 | De & Spillett, 1966 | x 45.5 |
| 5. | **Wilpattu,** Sri Lanka, '72-73 | 5.0<br>(at least) | Barrette, pers. comm. | |
| 6. | **Powderhorn** Texas, 1968 | 17.4 | Ables, 1969 | x 18.9 |
| 7. | **IIT,** Madras 1991-92 | 201.6 | Menon & Raman, 1992 | |

**Density Comparisons : Discussion:**

The density of spotted deer reported here is similar to the density (145.3 / km²) reported by Selvakumar (1979) for an area of about 250 hectares. The average density estimate of 4 censuses done in 1975, 78, 79, 80 is also almost the same as the current estimate. The estimate is however lower than the density (200.9/km² - average of five censuses) reported by Menon (1983). The density is not significantly different from the Forest Department estimate for the year 1991 - which was calculated in a similar way sing the TRANSECT program. Some Forest Department estimates, such as No. 5, in Table 2 are probably overestimates.

The density of spotted deer in G.N.P. does not appear to have changed appreciably over the last 10-15 years, if one is to go by the results in Table 2. The density seems to be stabilised at about 150/km² since 1975-1980 to the present day. The 1975-80 average was calculated from 4 censuses (head counts or transects) done by R.K.Menon, the Zoological Survey of India, R. Selvakumar & T.N. Forest Dept. The density estimate from transects by Menon 1981-82 is just slightly higher than the previous and the current years'. However, definite conclusions cannot be drawn as these censuses were done by different people with different techniques.

The density of chital in G.N.P. is also much higher than the densities of free-ranging chital in most sanctuaries (see Table 3). For example, the density of spotted deer is 36/km² around the Bandipur Tourist Zone -85/km² in one area, 50.6 /km² in Nagarhole and 23.2/km² for Kanha (2.8-3.1/km² for the whole of Kanha Park), at least 5/km² in an area of 150 km² in Wilpattu (Sharatchandra and Gadgil, 1975), (Karanth, pers. comm.), (Schaller, 1967), (Barrette, pers. comm.). The reasons for the maintenance of this high density may be the absence of significant predation (the only predators present are at least 4 jackals and a few feral dogs), variety and quality of the habitat/vegetation, protection from human disturbance and occasional grass-feeding by the Forest Dept. during the lean period.

It is also noted that the density is lower than the density of chital in the neighbouring Indian Institute of Technology campus which was once contiguous with this area. The difference is not statistically significant but probably reflects the actual picture quite accurately.

## Chital Populations in Surrounding Areas :

An estimate of the total chital population in the Guindy area is derived in Table 4. The once contiguous areas of I.I.T., G.N.P. and Raj Bhavan now harbour about 900 chital. The Total Population in the whole Guindy area is probably only 800-1000 chital.

Table 4: Total Chital Population in the Guindy Area

| **Place** | **Population** | **95% C.I.** | **Remarks** |
|---|---|---|---|
| G.N.P. | 456 | (389-524) | - TRANSECT,this study. |
| I.I.T. | 408 | (279-538) | - see Table 3, No.7 |
| Raj Bhavan | 100 | (50-150) | - Rough Estimate |
| CLRI, A.C.Tech. etc. | 36 | (20-50) | - do - |
| **TOTAL** | 1000 | (738-1262) | |

**Monthly Density Estimates** : Table 5 lists the monthly Fourier Series Estimates of spotted deer density in Guindy National Park. From the monthly replications, an average estimate of density weighted by line length and an empirical estimate of the variance of density is calculated by an option in the TRANSECT Program and is given as S.No.13 in Table 2. The estimated density of groups had a standard error of 4.395 and coefficient of variation 7.25.

Table 5 : Monthly Density Estimates in Guindy National Park 1991

| S.No | Month | Sample Size (N) | Mean Density of Groups (Dg) /km2 | Mean Density of Chital (D) /km2 | %age Coefficient of Varn. %Cv | 95% Confidence Interval of D /km2 | Total Population (Mean) | 95% Confidence Interval of Total Pop. |
|---|---|---|---|---|---|---|---|---|
| 1. | Jan | 26 | 84.0 | 201.8 | 22 | 116.2-287.2 | 546 | 314-777 |
| 2. | Feb | 17 | 55.0 | 112.5 | 26 | 55.5-169.5 | 304 | 150-458 |
| 3. | Mar | 28 | 66.8 | 160.6 | 26 | 79.6-241.4 | 434 | 215-653 |
| 4. | Apr | 26 | 72.6 | 189.5 | 24 | 101.2-277.7 | 513 | 274-751 |
| 5. | May | 19 | 60.4 | 157.5 | 25 | 80.6-234.4 | 426 | 218-634 |
| 6. | M-Jun | 29 | 42.8 | 131.7 | 22 | 76.2-187.3 | 356 | 206-507 |
| 7. | Jul | 23 | 57.8 | 190.6 | 27 | 88.4-292.8 | 516 | 239-792 |
| 8. | Aug | 19 | 64.1 | 235.6 | 23 | 129.7-341.6 | 637 | 351-924 |
| 9. | Sep | 29 | 86.1 | 273.2 | 21 | 158.5-387.8 | 739 | 429-1049 |
| 10. | Oct | 24 | 49.4 | 176.2 | 31 | 69.8-282.7 | 477 | 189-765 |
| 11. | Nov | 20 | 50.5 | 157.8 | 29 | 67.5-248.2 | 427 | 183-671 |
| 12. | Dec | 23 | 55.5 | 125.3 | 28 | 56.1-194.4 | 339 | 152-526 |
| 13. | Avg | ** | 60.6 | 169.1 | 7 | 141.8-196.4 | 457 | 384-531 |

## SPOTTED DEER : SEASONAL HABITAT USE & MOVEMENTS

Though detailed notes of the foraging behavior and feeding ecology of chital were not taken, observations were made to study seasonal usage of the three main habitat types (see section 2.1) by spotted deer. The replicate data from the two transects in the scrub and the single transect in the forest were pooled separately to come up with density estimates for these two vegetation types. The data were grouped into 5 metre widths and truncated at 30m for the forest transects and at 50m for the scrub for convenient analysis.

Pooling the data for the whole year (Table 6, S.No.4) shows no significant difference in density of chital in the two habitats. However, there are marked seasonal variations in usage of these two habitat, judging from the chital densities. Miura (1981) reports even diurnal variation in habitat use during the dry season.

**Dry Season : January to March :** January to March in Madras (Minambakkam) are the months of least rainfall - 23.8mm, 6.3mm and 15.1 mm for Jan, Feb & Mar respectively. (Source: Climatological Table, India Meteorological Dept., based on obs. from 1931 to 1960). During this period chital densities in the two habitats do not significantly differ, though the mean density is higher in the forest. My observations indicate that chital are more or less evenly distributed during this season but as the season progresses, more and more chital frequent the forest areas in search of forage; perhaps the fallen fruits/seeds/leaves of the deciduous trees; and shade from the daytime heat. Also, by March there is little green grass available in the scrub. Chital do frequent the scrub early in the morning and late in the evenings, and use the forest during midday (Miura, 1981).

**Summer or Pre-Monsoon Season : April and May :** With the increase in temperature and the number of hours of daylight this season is characterised by greatly increased usage of the forest habitat by chital (S.No.2, Table 6). The density of chital in the forest ($381.4/km^2$) becomes significantly higher than the density ($110.2/km^2$) in the scrub. The undergrowth is sparse and the visibility improves considerably. A combination of these factors led to marked increase in the sightings of deer in this vegetation. Chital were also seen to come to the tank/pond to drink between 0700 and 0830 hours. By 0830 most chital sought shade from the heat under large trees and in well wooded areas.

It must be noted that the drop in mean chital density in the scrub and the increase in the forest is not statistically significant compared to the previous season's values. But I believe, from my observations that the change in the mean density itself is a good indication of the actual trend.

Table 6:Seasonal Habitat Use by Chital in Guindy National Park, 1991.

| S.No | Vegetation Type | Season | Sample Size (N) | Mean Density of Groups (Dg) /km2 | %age Coefficient of Varn. %Cv | Std. Error | Mean Density of Chital (D)/$km^2$ | 95% C.I. of D /km2 |
|---|---|---|---|---|---|---|---|---|
| 1. | Scrub | Dry | 52 | 66.1 | 17.8 | 11.76 | 150.6 | 98.0-203.2 |
| | Forest | Dry | 20 | 114.6 | 23.4 | 26.77 | 264.7 | 143.5-386.0 |
| 2. | Scrub | Summer | 24 | 42.2 | 27.8 | 11.73 | 110.2 | 50.2-170.2 |
| | Forest | Summer | 21 | 148.4 | 27.1 | 40.18 | 381.4 | 179.0-583.9 |
| 3. | Scrub | Wet | 128 | 65.8 | 11.8 | 7.79 | 261.8 | 201.1-322.6 |
| | Forest | Wet | 19 | 38.6 | 28.3 | 10.94 | 90.4 | 40.2-140.6 |
| 4. | Scrub | 1991 | 204 | 61.9 | 9.3 | 5.75 | 205.6 | 168.2-243.1 |
| | Forest | 1991 | 60 | 74.1 | 15.4 | 11.44 | 177.9 | 124.1-231.7 |

C.I. - Confidence Interval
Dry Season - January to March
Summer or Pre-Monsoon Season - April & May
Wet or Monsoon Season - June to December

**Monsoon or Wet Season : June to December :** During this period Madras receives rain from both the South-West Monsoon (Jun-Sep) and the North-East Monsoon (Oct-Dec). The heaviest rainfall month is November with a mean total rainfall of 308.7mm. In 28.42 km of transects through the scrub there were 128 sightings of chital herds, and only 19 sightings in 13.44 km through the forest. By the first monsoon showers in June, fresh grass sprouted in the scrub areas and with continued good rains the chital moved back into the scrub. The chital density in the scrub rose significantly from the 110.2 of summer to 261.8 chital/km². This density was significantly higher than the density in the forest - which was 90.4/km². The density in the forest was a significant drop from the previous season.

The density of chital in the scrub during the SW & NE Monsoon periods did not differ significantly. The mean densities were : 283.4 and 240.9 /km² respectively.

My observations during the regular classification counts corroborated the above trends in habitat use, including the steep decline in chital density in the forest from the summer months to the wet season. Yet, the density estimates for the forest vegetation were derived from small sample sizes and may be inaccurate. Also, the transect through the forest was quite close and almost parallel to a major road for a sizable stretch. This may have contributed to successive overestimates, though the trend itself can still be perceived.

## 4. BLACKBUCK

### : ESTIMATION OF DENSITY & POPULATION SIZE:

: ***Data Features*** : The TRANSECT Program (Fourier Series Estimator) was used for density estimation. The data were grouped into ten 5 metre perpendicular distance intervals and also into eight 10 metre intervals for analysis. Visual estimation used for part of the study to ascertain perpendicular distances, may not have been totally accurate. In case of doubt, I measured the perpendicular distance by pacing upto the spot where the animal was seen.

: ***Results and Discussion*** :

The density of Blackbuck in the Park area excluding Polo Field (i.e. about 99% of the area) is about 20 Blackbuck per square kilometre. The density estimation using 10 metre intervals gives a smaller percentage coefficient of variation. This estimate puts the total population of Blackbuck in the park area excluding Polo Field at 52 animals (95% Confidence interval = 35 - 70 animals). The Mean number of Blackbuck frequenting Polo Field was calculated from about 5 total counts made every month. The mean was 16.5 (N = 63), with a standard error of 0.91. (see Table 7).

Table 7 : Blackbuck Density in Guindy National Park 1991
- Excluding Polo Field -

| S. No | Time Period | Estimator | Perpendicular dist. data type | ✓ N | Mean Density of Groups (Dg) /km2 | Mean Density of Blackbuck (D)/km2 | %age Coefficient of Varn. %Cv | 95% Confidence Interval of D /km2 | Total Population (Mean) | 95% C.I. of Total Pop. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | Jan to Dec | FSER | 5m widths | 42 | 8.48 | 22.1 | 20.8 | 13.1-31.0 | 59 | 35-83 |
| 2. | Jan to Dec | FSER | 10m widths | 50 | 7.53 | 19.6 | 16.7 | 13.2-26.0 | 52 | 35-70 |

N - Sample Size Pop. - Population C.I. - Confidence Interval

**Blackbuck Population Size :**

Adding the number of animals on Polo Field with the number estimated for the rest of the area gives a ***Total Population of 69 Blackbuck in Guindy National Park*** (95% Confidence interval = 52 - 87 Blackbuck, see Table 8). From my personal experience, I believe that the mean estimate may be slightly on the higher side, since the Blackbuck are patchily distributed and sightings were somewhat irregular. Sometimes, a Blackbuck male/group would be seen on the very same spot again and again at the same distance from the line.

Table 8 : Blackbuck Population Size in Guindy National Park

| **Population in the Park (excl Polo Field) (Pp) (Mean)** | **95% C.I. of Pp** | **Mean Number on Polo Field** (N = ~~34~~) 65 **(Pf)** | **Total Pop. in The Park (Mean)** **P = Pp + Pf** | **95% C.I. of P** |
|---|---|---|---|---|
| 52 | 35 - 70 | 16.5 | 69 | 52 - 87 |

*All units are Numbers of animals.*

A **total count** was attempted on 29.12.1991 by the author alone on foot between 1000 hrs and 1315 hrs. The census was not carried out early in the morning as Blackbuck are not very active then but become quite active from about 0930 hrs till about 1300 hrs. (Selvakumar, 1979). All areas where I had seen Blackbuck in 1991 were covered during the three-hour census and many potential areas were also scanned to check presence of Blackbuck, recent pellets etc. An area close to Duck pond (roughly 1-3% of the park area) was however not covered.

**Total Count of Blackbuck**
- Animals Seen -

Adult Males - 7 — 17.5%
Yearling/Juvenile Males - 4 — 10.0%.
Yearling/Adult Females - 27 —— 67.5%.
Fawns - 2 — 5%.

TOTAL - 40

A total of 40 Blackbuck were counted. This number includes a group of 7 animals seen at the extreme north-west corner of the park near Raj Bhavan. However, a few Blackbuck (at least one juvenile male seen the same evening and 1 or 2 fawns) were almost certainly missed during the count. Thus, the **Total Population** is probably ***50-60 animals.***

**Discussion :**

The mean density of Blackbuck in the Park (including Polo Field) is 25.5 / km² - for the period January to December 1991. This figure is much lower than the figures reported for previous years. For example, an average of 6 census (by means of headcounts and transects) estimates for the period 1975-80 gives the population figure as 295 animals (or 91 animals / km²) in an area of 800 acres. The average figure of 4 censuses (using transects) in 1981-82 is 333 animals (or 103 / km²) (Menon, pers. comm.). Selvakumar (1979) also reports a high density of 104 Blackbuck / km² and estimated that there were about 260 Blackbuck in the Park (area: about 250 ha.) in 1979. Menon (1983) remarks that due to the patchy distribution of Blackbuck, the transect estimates may be higher than the actual figure.

During this study, a high density of Blackbuck was seen only at the Open Meadow (Polo Field) and some small adjoining areas. Only small dispersed herds of Blackbuck were seen at other places in the Park. Blackbuck were not at all seen in some areas which seemed to be quite suitable to the human observer. My observations and walks through the various areas of the Park tally with and confirm the low densities estimated.

From my observations, I believe that Blackbuck do not exist in such numbers in Guindy National Park; as reported by the previous observers quoted above; any more. However, it must be noted that previous censuses usually included the animals seen in the adjacent Raj Bhavan compound. I could not establish the number of Blackbuck in Raj Bhavan, where they are reportedly common.

It is possible that a sizable number of Blackbuck are confined to the Raj Bhavan area. Since the number of Blackbuck within the Raj Bhavan compound is unknown, no conclusion is being drawn from the apparent fall in Blackbuck numbers. A short foray was made into Raj Bhavan by the author with a Forest Guard and a total of 18 Blackbuck were seen. This includes 7 animals seen near the NW corner of G.N.P.

From these observations and reports from forest guards and other visitors to Raj Bhavan I would estimate that in both the compounds taken together, about 100-125 Blackbuck are present. This estimate is to be treated with caution since no accurate count of Blackbuck in Raj Bhavan could be done by the observer.

Since the census techniques used were different over the years, the apparent severe drop in Blackbuck numbers from 1979/1981 to the present date may not be a very significant change. As remarked, my estimates for the Raj Bhavan area are approximate and the censuses of previous years may be overestimates. Hence it is difficult to definitely conclude without further analysis that the Blackbuck population is on the decline.

This however does not preclude taking effective management steps toward a healthier Blackbuck population. The suggestions of the Wildlife Warden to remove encroaching shrubs from the grassland areas and plant grass in selected spots may go a long way toward this end.

## BLACKBUCK : HABITAT USE AND SEASONAL MOVEMENTS

Blackbuck exhibit distinct preferences of habitat in the 2.7 $km^2$ Park area. **Polo Field:** Most Blackbuck congregated on the open meadow (Polo Field), where the mean Blackbuck density for the year was 550/$km^2$. (i.e. an average of 16.5 animals in an area of 0.03 $km^2$). This high density is perhaps a significant indication of the animals' preference for open terrain and is also presumably related to the availability of grass species on which they graze. In the summer months of March to May, when the grass is dry, fewer animals are seen on Polo Field. The mean number of Blackbuck for these months is 12.2 (N = 15, Std. error = 1.58). This may be a slightly high figure due to sampling error. During the wetter months from June to Jan, the mean is 17.9 (N = 48, Std. error = 1.01).

**Scrub and Dense Forest:** Blackbuck were also frequently seen in the scrub vegetation, which comprises of open and semi-open areas, throughout the year. During the wetter months (June to Jan), Blackbuck were almost never seen in the dense forest vegetation. With the onset of summer and consequent scarcity of grass in the meadow and scrub, the animals were observed to move into the forest zone in search of forage. Blackbuck were seen in the forest zone often from February to May. They did not frequent the really dense portions, but moved in small groups at forest fringes, clearings and roads and near the I.I.T wall where the undergrowth is not very thick. They were repeatedly seen at some of the same spots. A comparison of the density of Blackbuck *in the Scrub* for the whole year with the density during the wetter parts of the year (Table 9) is indicative of the above trend though not statistically significant.

Table 9: Blackbuck Densities in the Scrub Vegetation:

| S.No | Period | N | Dg (/$km^2$) | D (/$km^2$) | % Cv | 95% CI of D |
|---|---|---|---|---|---|---|
| 1. | Jan - Dec | 45 | 9.6 | 24.9 | 18.2 | 16.1-33.8 |
| 2. | Jun - Feb | 37 | 11.3 | 29.9 | 18.9 | 18.8-41.0 |

**Dg** - Density of Groups **%Cv** - %age Coefficient of Variation
**D** - Density of Blackbuck **N** - Sample Size **CI**- Conf. Interval

## 5. SUMMARY AND CONCLUSIONS

The present work is an attempt to study the biology of the populations of spotted deer and Blackbuck in Guindy National park. The study concentrates on aspects of population size, structure and dynamics of the two species. The study involved doing regular monthly transects; 3 transects were laid and each was done once in the morning and once in the evening. A system of stratified random sampling was used in laying transects and a total of about 6 km of transect was walked each month. The density estimation for the perpendicular distance data gathered was done using computer Program TRANSECT.

**Spotted Deer :** The results of the study, for the period January to December 1991 gives the size of the population (mean) of spotted deer as 456 animals (plus or minus 70 animals 95% confidence limits). This maybe a slightly high estimate and the actual population is probably about 380-450 or 415 animals. This density of spotted deer in the Park (153.4/km$^2$) is higher than the density of most other free-ranging populations of spotted deer. The population density of Chital in the park does not seem to have changed appreciably since the mid-seventies. This factor probably indicates that the population of chital in Guindy National Park has reached carrying capacity. The high densities are probably due to minimal predation and human disturbance, variety and quality of habitat.

**Blackbuck :** The size of the Blackbuck population (mean) is estimated to 69 animals (plus or minus about 18 animals - 95% Confidence limits). A total count attempted on 29.12.1991 suggests a figure of about 50-60 Blackbuck in Guindy National Park. This and the drop in density from 103.8/km$^2$ in 1979 to 25.5/km$^2$ in 1991 indicates a marked decrease in Blackbuck numbers. Since the numbers of Blackbuck within the Raj Bhavan compound and I.I.T. are not known, and previous transect estimates (means) may be overestimates due to the patchy distribution of Blackbuck no definite conclusions are being drawn here as to the total population trends. However, it is roughly estimated that there are about 100-125 Blackbuck in the Raj Bhavan and G.N.P. compounds taken together.

**Some Suggestions :** Considering the apparent decrease in Blackbuck numbers, the Wildlife Warden's plans to remove weeds from Polo Field and plant grass in selected areas is to be commended. A corridor between G.N.P. and Raj Bhavan exists at the extreme North-West corner of the Park, near the Forest Superintendent's Office. Another, more accessible corridor can perhaps be opened up through the fence behind Polo Field - this might assist in the seasonal movements of Blackbuck in search of extra forage when Polo Field and scrub areas are dry, prevent the isolation of the two small populations from each other and facilitate their intermingling.

An effort that will be beneficial to the spotted deer will be the prevention and removal of garbage being unwittingly dumped in the Park, especially close to the Snake Park entrance. I have seen chital chewing on polythene popcorn covers, presumably attracted by the salt; paper etc. One carcass of a male found in January 91 had a chewed up polythene cover close to the remains of the stomach contents. On one occasion one female was seen feeding on human faeces near the snake park entrance. A few large waste bins with lids can be put up near the Children's Park and Snake Park entrances for use by visitors to dump garbage. The Forest Department's plans to establish salt licks in the Park may attract chital away from these garbage products.

To monitor the populations of the two ungulates over a longer span of time it is suggested that a total count be done every season to enumerate Blackbuck, in keeping with their patchy distribution. In the summer the total count will have to essentially cover the forested areas also as Blackbuck move into this vegetation. During the wet season, only the scrub and Polo field areas need be scanned. Chital numbers can be reliably estimated using Transects and the TRANSECT program. A vehicle count on a certain route along the roads can be easily done with 2 or 3 observers each season (suggested by Mr S Sathyakumar). Once standardized against existing population estimates, this method can be conveniently and efficiently used to obtain good estimates, year after year. During the peak of summer, in May when visibility is maximum even in the forest vegetation, a drive count can be done, early in the morning, to obtain the population estimate.

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